

STRESS AND HOMEOSTASIS

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The stress response in an animal is a non-specific reaction to stressors. It facilitates homeostasis via integrated neural, hormonal, physiologic, and behavioural responses. It is implicit that the stress response is unlikely to be an "all-or-none" response. The pattern of physiologic responses may provide an objective measure of the stress response. In two studies, adrenal glands and samples of blood and urine were collected from pigs and sheep presented by producers for slaughter at two commercial abattoirs in Western Australia. Details of the conditions for the animals in transit and in holding pens were collected also. Plasma and urine pH, osmolality, concentrations of urea, sodium, potassium, calcium and magnesium, plasma concentrations of glucose and lactate, and ascorbic acid content of adrenal glands were measured.

The data were analysed using canonical variate analysis, which considered animals grouped a priori according to possible stressors, and principal component analysis, which did not. In both analyses plasma concentrations of calcium and magnesium were the principal discriminatory variables. When the plasma calcium and magnesium were plotted as a bivariate scatter diagram there was clear resolution of the data into two groups for each species: those slaughtered between January and March and those slaughtered between June and July (Fig 1). For each species the plasma concentrations of calcium and magnesium differed between animals slaughtered in summer and those slaughtered in winter ($p(0.05)$). Too many factors were confounded to ascribe these responses to specific stressors. In sheep, lipolysis induced by adrenaline or noradrenaline, or by exposure to adverse circumstances is associated with uptake of calcium and/or magnesium by adipose tissue, with concomitant decreases in plasma concentrations of calcium or magnesium or both (Moseley and Axford 1973; Terashima et al. 1983). The response depends on the severity and duration of the stressor and may be emphasised in animals that are lean or in poor condition. Plasma calcium and magnesium together, as physiologic indicators of neuro-endocrine stress responses, may provide a practicable means of assessing stress in livestock in commercial situations.

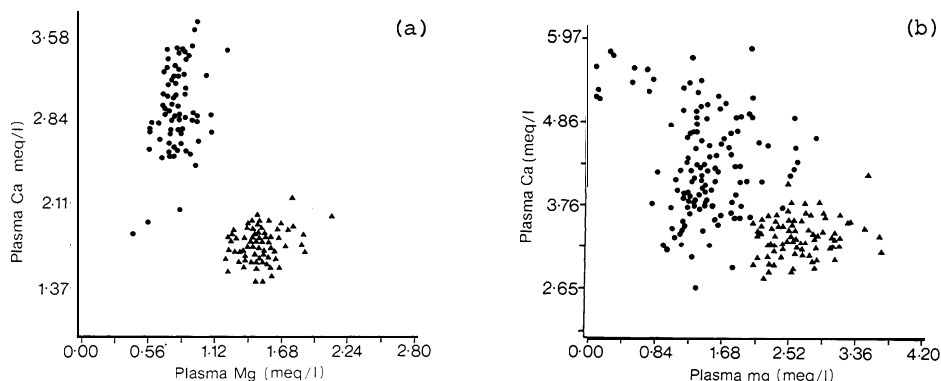


Figure 1 Plasma Ca and Mg in pigs (a) and sheep (b) at slaughter in summer (●) and winter (▲).

MOSELEY, G. and AXFORD, R.F.E. (1973). *J. agric. Sci. Camb.* **81**: 403.

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